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ABSTRACT

The purpose of this study was to profile the preferred productivity and learning style preferences of participants enrolled in distance education courses at Marshall University (West Virginia) (Spring of 1995). The accessible population of this study consisted of 167 distance education participants in nursing, education, and paralegal programs. A stratified random sample of 117 was drawn to provide study data. The data collection instrument was the Productivity Environmental Preference Survey (PEPS). The 100 items of the PEPS yield scores in 20 areas. The average internal consistency reliability for the 20 areas was 7.1. One-way analyses of variance were used to compare the group means of the 3 program areas on each of the 20 PEPS areas. Findings suggest that environmental, sociological, and perceptual preferences are essential for maximizing productivity. Individuals responsible for designing learning and working environments for distance education learners need to design a paradigm that is flexible to meet individual preferences for optimum learning and productivity. (Contains 3 tables and 22 references.) (Author/SLD)

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Analysis of Productivity and Learning Style Preferences of Participants in Distance Education

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Abstract

The purpose of this study was to profile the preferred productivity and learning style preferences of participants enrolled in distance education courses at Marshall University (Spring of 1995). The accessible population for this study consisted of distance education participants at Marshall University in three program areas: Nursing, Education, and Paralegal (N=167). A stratified random sample (n = 117) was drawn to provide data for this study. The data collection instrument was the Productivity Environmental Preference Survey (PEPS). The PEPS (100 items) yield scores in 20 areas. The average internal consistency reliability for the 20 areas is .71. One-way analyses of variance were used to compare the group means of the three program areas on each of the 20 areas from the PEPS. Findings from this study suggest that environmental, sociological, and perceptual preferences are essential for maximizing productivity. Individuals responsible for designing learning and working environments for distance education learners need to design a paradigm that is flexible to meet individual preferences for optimum learning and productivity.

Analysis of Productivity and Learning Style Preferences of Participants in Distance Education

According to Gunawardena and Boverie (1993), the increasing use of telecommunications to mediate the communication process in distance education will have a major impact on the design of distance education programs for the 21st century.

Research on teaching effectiveness has been inconclusive in identifying a singular method of instruction that works well with all individuals. A growing body of research suggests students learn best when they are taught using methods that complement their preferred learning style.

Thies (1979) defined learning style as a biological and developmentally imposed set of personal characteristics that make a teaching method effective for some and ineffective for others. An instructional research model by Keefe and Monk (1988) viewed learning style as an umbrella term which encompasses cognitive, affective, and physiological/environmental dimensions.

The effect of the instructional environment to stimulate or inhibit learning for students with selected learning style characteristics is well

documented (Dunn, 1987; Price, 1980). Correlational studies (Dunn, Cavanugh, Eberle, & Zenhausern, 1982) revealed sets of traits among students within the same age or grade and among those with similar talents, achievements, and interest.

In four studies (Cholakis, 1986; DeBello, 1985; Miles, 1987; & Perrin, 1984), students' sociological preferences were identified and instructional strategies were matched with their preferences. They achieved significantly higher test scores in matched conditions and significantly lower test scores when mismatched. Students' time preferences--morning "early birds" versus afternoon "night owls"--for learning also influenced achievement. Most students are not morning alert. At the elementary school level, approximately 28 percent appear to be "early birds." A majority (60%) of high school learners, on the other hand, remain most alert in the late morning and afternoon (Price, 1980).

Coggins (1988) and Ehrman (1990) suggested that there is a lack of research on the productivity and learning style preferences of distance education participants.

Purpose and Objectives

The primary purpose of this study was to profile the preferred productivity and learning style preferences of participants enrolled in distance education courses at Marshall University. The research objectives were as follows:

1. To determine the productivity and learning style preferences of distance education participants by program area.
2. To compare the productivity and learning style preferences of distance education participants by educational classification/level.
3. To determine the productivity and learning style preferences of distance education participants by age.

Theoretical Framework

Productivity style theorizes that each individual has a biological and developmental set of learning characteristics that are unique. Productivity will improve when the corporate organization and instruction are provided in a manner that capitalizes on each individual's learning strengths. This theory is based on the generally accepted concept that individual students at every age level differ in how they learn new and

difficult information. The concept of individual differences is well established in the psychological and educational literature (Good & Brophy, 1986) and has been corroborated by the extensive research conducted with this model at more than 60 institutions of higher education in the United States (Price, Dunn, & Dunn, 1991). This learning style model also includes elements derived from the constructs of cognitive style (Kagen & Kogen, 1970) and brain lateralization (Ornstein & Thompson, 1984).

Productivity style, as a model, embraces several general principles in form of philosophical assumptions (Price, Dunn, & Dunn, 1991):

1. Most individuals are capable of learning.
2. The learning conditions in which different individuals learn best vary extensively.
3. Individual learning preferences exist and can be measured reliably.
4. Most students are self-motivated to learn when they have the option of using their learning style preferences and experience success.

5. Use of individual learning style strengths as the basis for instruction increase learning and productivity.

Research Procedures

Population and Sample

Survey research methodology was used in this study. The target population for this study was all students enrolled in Distance Education courses via West Virginia Satnet during Spring of 1995. The accessible population for this study consisted of distance education participants at Marshall University in three program areas: Nursing, Education, and Paralegal (N=167). A current enrollment list was obtained from the College of Adult and Extended Education which served as the sampling frame for this study. A stratified random sample was drawn to provide data for this study. According to Krejcie and Morgan (1970), a sample size of 117 is needed at a 95% confidence level to represent a population of 167.

Instrumentation

The instrument used to collect data for this study was the Productivity Environmental Preference Survey (PEPS) developed by Price, Dunn and Dunn (1991). PEPS is a 100-item (Likert-format) survey

designed to diagnose adults' productivity and learning styles. Additionally, the instrument is useful for prescribing the type of environment, working conditions, activities, and motivating factors that would maximize individual output. The PEPS (100 items) yield scores in 20 areas.

The instrument was refined through two pilot administrations (N=900 and N=589 adults respectively) to establish face, construct, and predictive validity (Price, Dunn, & Dunn, 1991). The average internal consistency reliability as measured by Hoyt's (1941) analysis for the 20 areas is .71. The Hoyt analysis is equivalent to the Kuder-Richardson (1937) formula 20 (KR20).

The PEPS areas with highest reliabilities include: sound/noise, level, light, temperature, design, persistent, responsible, structure, learning alone/peer oriented, auditory, visual, intake, learning/working in evening/morning, late morning, afternoon, and mobility.

PEPS areas with low reliabilities include: motivation, authority figures present, learning in several ways, tactile, and kinesthetic.

For this study, content validity was assessed by a panel of experts composed of the dean of Adult and Extended Education, the program

manager for telecourses, and teacher educators. The validation panel agreed that PEPS was a suitable instrument for the researcher to use in measuring the productivity and learning style preferences of distance education participants.

Data Collection

Data were collected during April of 1995. All 117 participants identified were sent a cover letter and a PEPS questionnaire via satellite facilitators.

A follow-up mailing ensured high return. As a result, the final useable responses totaled 106, for a return rate of 90.60%. Because of the high response rate, a planned telephone follow-up of non-respondents was not conducted. Borg (1983) claims that a follow-up is not necessary if the response rate is over 80%.

Analysis of Data

The data from the questionnaires (PEPS) were analyzed using the SPSS/PC+ Version 4.0 (Norusis/SPSS, Inc., 1990) computer software. Descriptive and inferential statistics were used to describe the data. An alpha level of .05 was established a priori for this study.

Results and Discussion

The age range of distance education participants was 19 to 59 years with an average age of 35 years (SD=8.5). Of the 106 distance education participants, 94 (88.68%) were female and 12 (11.32%) were male.

Objective 1: Table 1 is a summary of the findings which includes group means and standard deviations for each area, F and p values from each ANOVA, and post hoc results.

Insert Table 1 about here

One-way analyses of variance were used to compare the group means of the three program areas on each of the 20 areas from the PEPS. Significant differences among groups were found for seven of the 20 areas.

Distance education participants in the nursing program area preferred to learn and work in bright light when compared with participants in the paralegal area. This finding suggests that bright light serves as an energizer for individuals in certain program areas.

According to Treichel (1974) individuals who require a lit environment, can become apathetic and find it difficult to remain alert if lighting is inadequate.

When compared with education and paralegal students, nursing students were more peer-oriented. This would suggest that these students should work in groups with colleague-oriented individuals that complement their sociological characteristics.

Nursing participants preferred to learn more through their tactile and kinesthetic sense when compared to paralegal students. These findings suggest that participants in this program area should be exposed to learning activities involving a sense of touch and real-life experiences in order to learn and retain what was learned. Further, some individuals learn best through a combination of two or more senses.

Distance participants in the education program area preferred intake, preferred to learn in late morning, and preferred mobility when compared to their counterparts. These findings imply that intake relaxes the tension that some students experience when concentrating. In addition, some students perform well at late morning and need a great deal of mobility in the learning environment.

Although not significant, it is worthwhile noting that distance education students in the paralegal area preferred to learn through their visual sense and during the afternoon when compared with students in the other two groups.

Objective 2: Significant differences among group members were found for six of the 20 areas (see Table 2). Sophomores in this study preferred to learn through formal design and were more peer oriented when compared with graduate students. These findings indicate that the necessary resources should be provided for peer oriented learners to function effectively in a more formal design when taking selected satellite courses.

Juniors enrolled in distance education courses had a need for more structure when compared with first year students (freshmen). It is therefore important to recognize students who are unable to function comfortably unless well-defined directions and procedures are given to them.

Insert Table 2 about here

Graduate students in this study preferred to learn in several ways, preferred intake, and preferred mobility when compared with the other four groups.

Objective 3: Distance education participants were divided into the following age groups: ages 18-24; 25-34; 35-44; 45-54; and 55 and over. Table 3 has a break down of the numbers in each age group. Significant differences among group means were found for four of the 20 areas.

Distance education participants within the 45-54 years range preferred working under bright illumination, preferred a "formal" climate, and preferred working in the morning when compared with individuals within the 18-24 years range.

Insert Table 3 about here

Conclusions

Distance education participants in the nursing program were more likely to work in brightly lit environment, preferred learning with peers, and preferred to learn through tactile and kinesthetic sense when compared to

paralegal students. These findings suggest that environmental, sociological, and perceptual preferences are essential for maximizing productivity.

Participants in the education program had strong preferences for the physical elements (intake, late morning, and mobility) in the learning environment when compared to participants in the other program areas.

Sophomores in this study had a preference for learning through formal design and were more peer oriented when compared to graduate students. In this study, sophomores were inclined to work in groups and in a "formal" climate.

Juniors demonstrated a need for more structure when compared to freshmen. This implies that well-defined directions and procedures should be given to these students.

Productivity and learning style preferences of graduate students were likely to be influenced by sociological and physical elements in the learning environment.

Non-traditional distance education learners preferred bright light, had a need for formal design, and learn best in the morning when compared to traditional distance education learners.

Recommendations

Individuals responsible for designing learning and working environments for distance education learners need to design a paradigm that is flexible to meet individual preferences for optimum learning and productivity.

Interactive activities among sites should be designed according to the various learning styles involved.

Alternative activities should be made available for students who may not want to be involved in group activities.

Preservice education for distance education teachers should include instruction on the following elements of productivity and learning style:

(a) immediate environment (light and design);

(b) emotionality (structure);

(c) sociological needs (peer oriented, and combined ways);

(d) physical needs (perceptual preferences, time of day, intake, and mobility).

Inservice education for distance education teachers should focus on how to redesign the educational environment to increase productivity in learning environments.

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Table 1
Comparison of the Productivity/Learning Style of Participants by Program (N=106)

PEPS Area	Group 1=Nursing (n=55) Mean S.D.	Group 2=Education (n=34) Mean S.D.	Group 3=Paralegal (n=17) Mean S.D.	F Ratio	F Prob.	Pairs*
1. Sound	14.56 4.14	12.70 4.84	13.82 4.11	1.8931	.1558	
2. Light	22.69 4.63	20.73 5.07	18.47 4.17	5.6829	.0046	3-1
3. Temp.	14.94 4.76	15.38 4.72	15.11 4.83	.0884	.9155	
4. Formal Design	17.05 3.15	15.73 3.44	15.64 3.10	2.2965	.1057	
5. Motivated/ Unmotivated	20.43 2.07	20.64 2.25	19.47 4.50	1.1721	.3138	
6. Persistent	17.89 2.06	16.88 2.45	17.76 4.17	1.6245	.2020	
7. Responsible	25.30 3.82	24.76 4.62	24.82 4.33	.2098	.8111	
8. Structure	10.67 3.87	11.02 1.78	10.17 2.78	.4153	.6612	
9. Learning Alone/ Peer-Oriented	24.70 5.97	20.73 5.53	20.41 6.17	6.4126	.0024	3-1, 2-1
10. Authority-Oriented Learner	13.87 2.05	13.17 1.93	13.11 2.23	1.6258	.2018	
11. Several Ways	13.50 2.10	14.20 1.78	14.29 1.99	1.7691	.1756	
12. Auditory Preferences	13.80 3.19	13.11 3.41	12.47 3.59	1.1758	.3127	

Table 1 (continued)

	Group 1=Nursing (n=55)	Group 2=Education . (n=34)	Group 3=Paralegal (n=17)			
PEPS Area	Mean S.D.	Mean S.D.	Mean S.D.	F Ratio	F Prob.	Pairs*
13. Visual Preferences	17.78 3.65	19.44 3.93	19.76 6.15	2.3478	.1007	
14. Tactile Preferences	13.85 2.56	13.76 2.10	12.17 3.04	3.0718	.0506	3-2, 3-1
15. Kinesthetic Preferences	16.40 1.96	15.94 1.93	13.82 4.92	6.1896	.0029	3-2, 3-1
16. Requires Intake	24.45 4.11	25.14 4.78	21.64 6.52	3.1544	.0468	3-1, 3-2
17. Evening/ Morning	24.92 5.96	25.58 5.92	23.11 5.52	1.0087	.3683	
18. Late Morning	8.96 1.37	9.35 1.72	8.35 1.69	2.3941	.0963	3-2
19. Afternoon	8.52 2.89	7.97 2.86	8.70 2.49	.5434	.5824	
20. Needs Mobility	17.25 3.16	18.94 2.61	15.47 4.33	6.9372	.0015	3-1, 3-2 1-2

Note. *Denotes pairs of groups significantly different at $p < .05$ level with utilization of the Duncan's multiple comparison test.

Table 2
Comparison of the Productivity/Learning Style of Participants by Level (N=106)

	Group 1 FR. n=11	Group 2 SO.n=13	Group 3 JR.n=17	Group 4 SR.n=36	Group 5 GR.n=29			
PEPS Area	Mean S.D.	Mean S.D.	Mean S.D.	Mean S.D.	Mean S.D.	F Ratio	F Prob.	Pairs*
1. Sound	15.00 4.73	13.84 4.09	13.82 4.01	14.56 3.89	12.55 5.17	1.0459	.3875	
2. Light	20.18 4.16	23.00 3.02	22.64 5.13	21.00 5.08	20.86 5.47	.9290	.4503	
3. Temp.	14.36 4.12	13.76 3.87	13.76 4.16	16.00 4.93	15.69 5.21	1.1095	.3563	
4. Formal Design	16.45 2.69	18.07 2.81	17.23 2.90	16.25 3.23	15.34 3.67	1.9647	.1056	5-2
5. Motivated/ Unmotivated	19.90 4.15	20.07 2.59	20.05 3.43	20.33 1.78	20.82 2.52	.3849	.8190	
6. Persistent	17.45 4.63	18.00 2.23	18.23 2.10	17.55 1.81	16.96 2.98	.7338	.5710	
7. Responsible	25.90 4.10	24.26 5.20	25.82 2.87	24.97 3.34	24.65 5.21	.3909	.8147	
8. Structure	8.72 2.68	11.23 1.83	11.64 6.08	10.41 2.20	11.03 1.93	1.7479	.1453	1-5, 1-3
9. Learning Alone/Peer-Oriented	21.90 6.78	24.61 6.97	23.88 7.64	23.77 4.80	20.27 5.71	1.9805	.1031	5-4
10. Authority-Oriented Learner	13.00 2.36	14.61 1.75	13.58 2.57	13.41 1.85	13.44 1.93	1.1848	.3221	
11. Several Ways	13.27 2.10	13.76 2.61	13.23 2.13	13.72 1.66	14.65 1.85	1.8973	.1167	3-5
12. Auditory Preferences	12.63 3.69	14.23 2.94	14.05 2.88	13.27 3.33	12.96 3.66	.6350	.6387	

Table 2 (continued)

PEPS Area	Group 1 FR. n=11 Mean S.D.	Group 2 SO.n=13 Mean S.D.	Group 3 JR.n=17 Mean S.D.	Group 4 SR.n=36 Mean S.D.	Group 5 GR.n=29 Mean S.D.	F Ratio	F Prob.	Pairs*
13. Visual Preferences	18.18 6.11	18.30 4.26	18.47 3.80	18.36 3.89	19.37 4.40	.3041	.8747	
14. Tactile Preferences	13.00 3.16	13.15 3.05	13.17 2.03	13.80 2.76	13.86 2.15	.4828	.7483	
15. Kinesthetic Preferences	14.36 5.06	16.30 3.27	15.82 2.76	15.94 2.08	16.06 2.06	.9308	.4493	
16. Requires Intake	21.00 7.04	24.76 4.34	25.23 3.64	23.55 4.55	25.44 4.80	2.1298	.0825	1-3, 1-5
17. Evening/ Morning	25.00 6.00	23.53 5.73	25.23 6.68	24.66 5.95	25.37 5.64	.2415	.9142	
18. Late Morning	8.90. 1.75	8.46 1.76	8.88 1.79	9.02 1.13	9.27 1.75	.6367	.6375	
19. Afternoon	6.81 2.40	9.23 2.91	8.70 2.56	8.75 2.97	7.93 2.72	1.5722	.1875	
20. Needs Mobility	14.81 4.72	18.38 2.72	15.82 3.04	17.75 2.91	18.82 3.07	4.7042	.0016	1-4, 1-2 1-5, 3-4 3-2, 3-5

Note. FR.=Freshmen; SO.=Sophomores; JR.=Juniors; SR.=Seniors; GR.=Graduate Students. *Denotes pairs of groups significantly different at $p < .05$ level with utilization of the Duncan's multiple comparison test.

Table 3
Comparison of the Productivity/Learning Style of Participants by Age (N=106)

Group Number	1	2	3	4	5			
Age	18-24	25-34	35-44	45-54	55&over			
n=	17	29	35	23	2			
PEPS Area	Mean S.D.	Mean S.D.	Mean S.D.	Mean S.D.	Mean S.D.	F Ratio	F Prob.	Pairs*
1. Sound	12.88 3.82	13.62 3.97	14.85 4.42	13.39 5.19	13.00 7.07	.7529	.5584	
2. Light	21.35 3.75	21.96 5.08	19.80 5.28	23.30 4.25	19.00 7.07	2.0850	.0883	3-4
3. Temp.	16.11 4.72	13.79 4.49	15.97 5.11	14.69 4.09	15.50 7.77	1.1008	.3604	
4. Formal Design	15.58 3.67	16.24 3.03	16.00 3.00	18.00 3.06	14.50 7.77	2.0189	.0974	1-4, 3-4
5. Motivated/ Unmotivated	20.17 2.24	20.13 2.58	20.54 2.17	20.30 3.72	22.00 1.41	.2956	.8802	
6. Persistent	16.88 1.96	17.41 2.09	18.02 2.52	17.30 3.71	19.50 .70	.8997	.4672	
7. Responsible	24.35 4.06	25.58 3.35	24.14 4.80	26.34 3.99	24.50 2.12	1.2433	.2975	
8. Structure	11.17 1.62	11.27 1.64	10.71 4.70	9.86 2.37	8.00 2.82	1.1045	.3587	
9. Learning Alone/Peer-Oriented	23.58 4.98	25.13 5.62	21.22 6.33	21.78 6.68	18.50 4.94	2.1703	.0777	3-2
10. Authority-Oriented Learner	13.52 1.28	14.00 1.85	12.91 2.24	14.00 2.27	12.00 2.82	1.7911	.1364	
11. Several Ways	14.17 1.84	13.51 2.08	14.20 1.84	13.47 2.27	14.50 2.12	.8216	.5144	
12. Auditory Preferences	13.52 4.03	12.86 3.33	13.51 3.15	13.65 3.32	13.50 2.12	.2291	.9215	

Table 3 (continued)

Group Number	1	2	3	4	5			
Age	18-24	25-34	35-44	45-54	55&over			
n=	17	29	35	23	2			
PEPS Area	Mean S.D.	Mean S.D.	Mean S.D.	Mean S.D.	Mean S.D.	F Ratio	F Prob.	Pairs*
13. Visual Preferences	18.17 2.94	18.51 4.70	18.97 3.97	18.34 5.00	21.50 6.36	.3495	.8438	
14. Tactile Preferences	12.88 2.26	14.00 2.23	13.08 2.51	14.04 3.14	15.50 .70	1.3203	.2675	
15. Kinesthetic Preferences	15.11 2.71	16.24 2.58	15.97 1.99	15.78 3.75	14.50 6.36	.5690	.6857	
16. Requires Intake	23.17 3.71	25.24 5.05	24.82 3.76	23.13 6.65	20.50 .70	1.2320	.3021	
17. Evening/ Morning	22.70 4.95	24.55 6.13	25.00 5.63	26.86 6.36	21.50 4.94	1.4518	.2226	1-4
18. Late Morning	8.76 1.39	9.34 1.51	8.88 1.54	9.00 1.62	7.50 3.53	.9520	.4374	
19. Afternoon	9.23 2.46	8.58 2.93	8.42 2.94	7.47 2.71	7.50 2.12	1.0747	.3731	
20. Needs Mobility	17.35 3.27	17.89 3.61	17.42 2.58	17.26 4.47	17.50 .70	.1342	.9694	

Note. *Denotes pairs of groups significantly different at $p < .05$ level with utilization of the Duncan's multiple comparison test.